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ABSTRACT

The Measure of Academic Talent (MAT) is a standardized measure of academic development that controls for socioeconomic status-related background characteristics (e.g., income, language in the home, etc.) for different race and sex groups. In this study, the MAT was derived from American College Testing (ACT) program assessment data, using a sample of 169,116 high school students (108,036 minority and 61,080 white students) from the ACT-tested graduating class of 1987. Use of the MAT reduced score differences between various races by sex groups that were present using the ACT Composite. However, based on a sample of 7,836 fall 1987 freshmen from three universities, the accuracy of the MAT was generally no better than the ACT Composite for predicting first-year college grade point average and retention status, as measured by correlations and by proportions of students correctly admitted/not admitted. Other uses of the MAT for increasing minority representation and success in college are discussed, including recommendations for the use of the MAT at individual institutions. Three tables and two figures give participant characteristics and results. (Author/SLD)

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Measuring Academic Talent Independently of Race- and Sex-Related Factors

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Abstract

The MAT is a standardized measure of academic development which controls for SES-related background characteristics (e.g., income, language in the home, etc.) for different race and sex groups. It is derived in this study from ACT Assessment data, using a sample of 169,116 high school students from the ACT-tested graduating class of 1987. Using the MAT reduced score differences between various race by sex groups that were present using the ACT Composite. Based on a sample of 7,836 Fall, 1987 freshmen from three universities, however, the accuracy of the MAT was generally no better than the ACT Composite for predicting first year college GPA and retention status, as measured by correlations and by proportions of students correctly admitted/not admitted. Other uses of the MAT for increasing minority representation and success in college are discussed, including recommendations for the use of the MAT at individual institutions.

Measuring Academic Talent Independently of Race- and Sex-Related Factors

Racial minorities, and those of low socioeconomic status (SES), generally score lower than Whites and higher SES students on standardized college admissions tests (ACT, 1988). These students also enroll in college at lower rates (Manning, 1989) and fail in college at higher rates (e.g., Tracey and Sedlacek, 1987). Thus, examining possible alternative or additional admissions criteria for these students, and predicting and improving their chances of success in college, are important objectives. Manning (1989) used SAT Total scores to develop the Measure of Academic Talent (MAT), a standardized measure designed to assess objectively college bound students' talent while taking into account SES and race and sex factors. Development of the MAT grew out of a conference sponsored by the Center for Research on Minority Education at the University of Oklahoma in October, 1987 (Ward and Cross, 1989).

The MAT was designed to be a measure "of the degree to which a student has overcome the educational handicap that poverty and minority status often impose" (Manning, 1989), and may be a valuable way to identify promising minority students. It was intended to compare quantitatively the academic ability of students relative to others of the same SES and ethnic background. Once developed, it could be a valuable supplement to other admissions criteria, and might be expected to increase minority representation in colleges. Manning (1989) reported on the development of the MAT with SAT data and found that it did correct for SAT Total score differences between race and sex groups. At present, no results have been reported on the predictive validity of the MAT based on SAT Total scores. The purpose of this study was to describe the development of the MAT from ACT Assessment

data, and to examine the relationships between the MAT and first year college GPA and retention rates. Finally we will discuss implications and other potential applications of the MAT for college admissions decisions.

Data for the Study

The ACT Assessment is a comprehensive evaluative, guidance, and placement program used by over a million college-bound students each year. It consists of four academic tests, four self-reported high school grades, a Student Profile Section (SPS), and the ACT Interest Inventory. The academic tests measure students' educational development in four areas: English Usage, Mathematics Usage, Social Studies Reading, and Natural Sciences Reading. The ACT Composite is an arithmetic average of the scores of these four tests, and is often used as a measure of overall educational development.

For this study we used two sets of student data from ACT's history files for 1987-88. Our file consisted of the ACT-tested graduating class of 1987. (1985-86 tested juniors and 1986-87 tested seniors.) Each record contained the ACT Composite score, which ranges from 1 to 35, four self-reported high school grades in English, mathematics, social studies and natural science, and background information including sex, race, and SES indicators. Race included Asian-Americans, Blacks, Mexican-Americans, Native-Americans, Puerto Ricans, and Whites. SES indicators were family income, number of siblings, type of high school (college prep or other), percent of students enrolled in the student's high school who were minority, and language spoken at home (English versus other). This file includes all minority students (N=108,036) and a 10% random sample of White students (N=61,080).

The record consisted of 1987-88 enrolled college freshmen from these

large public universities with predominantly White student bodies. The universities participating in the study provided college freshmen GPA and retention status data (N=7,836). Retention study was defined as reenrollment in Fall, 1988 (the start of the students' second year).

Method

We computed the MAT using methods similar to those used by Manning (1989) based on SAT data. The ACT Composite was regressed on the five SES indicators separately for the 12 race by sex categories. The residual between the actual and predicted ACT Composite became the raw MAT score, which we rescaled to the same metic as the national ACT Composite (mean = 18.6, SD = 6.0).

Correlational and regression analyses related the MAT to other variables of interest. These analyses included correlations of the MAT with ACT Composite, self-reported high school grades, high school rank, and college grades. Regression analyses predicted college GPA using the MAT, ACT Composite, high school rank, and high school grades. Logistic regression was used to predict students' probability of college success (GPA $\geq$ 2.0) or probability of persisting (enrollment in the fall term of the second year) from the MAT or the ACT Composite.

Results

Development of the MAT

Table 1 presents descriptive statistics by race and sex group for the ACT Composite and the five predictors that serve to estimate the MAT for each race and sex group. White students reported higher incomes and fewer number of siblings than did other racial/ethnic groups. Both Asian and White students reported enrolling in a college preparatory curriculum

more frequently and attending high schools with fewer minorities than did other groups. Whites and Blacks reported the lowest rates of English as a second language in the home; Asians, Mexican-Americans, and Puerto Ricans scored had much higher proportions on this variable.

Table 2 contains the regression estimates for each variable that predicted the ACT Composite, along with the multiple R and standard error of estimate (SEE) for each group. All coefficients indicate that higher SES is related to lower ACT Composite score, with the exception of number of siblings for White students.

The distribution of ACT Composite scores showed that Whites obtained the highest scores, Blacks the lowest, and other minority groups obtained scores in-between (Figure 1). The distribution of MAT scores was similar for all race/sex categories (Figure 2). This confirmed that the MAT, as derived from ACT data, showed almost no variation across race/sex groups.

The simple correlations between the MAT and high school rank and grades (r=.52 and .55) using the national sample. Correlations were also lower for the MAT for students at each of the three schools (r=.27 to .38 for the MAT and r=.36 to .45 for the ACT Composite). The correlation between the MAT and the ACT Composite was 7.80 nationally and at each school.

College Variables

Examining the relationships of the MAT to the two college outcome measures constituted the next step of the analysis. Keep in mind that the MAT was devised from the national weights and applied to the college samples. Retention analyses were conducted for two of the three schools, due to individuality of data.

The MAT had lower simple correlations with college GPA (r=.26 to .36)

than did the ACT Composite (r=.36 to .43) at the 3 schools.

Multiple regression analyses predicted college GPA from combinations of the ACT Composite, and MAT with high school grades. The regression analyses indicated that the MAT plus high school grades predicted college GPA slightly lower than the ACT Composite plus high school grades at each institution (.46 to .54 versus .48 to .56).

We used logistic regression to compute probabilities of college success for students using MAT or ACT Composite scores. We dichotomized ACT Composite and MAT scores, according to a cutoff score of < 15 or ≥ 15 on the ACT Composite; the corresponding MAT cutoff score was such that an equal proportion of students would be predicted to succeed as for the ACT Composite. Success was defined as freshman GPA of at least 2.0 (A = 4.0), or as reenrollment at the start of the second year. The probabilities provided information to compute true positives and true negatives, and false positives and false negatives. True positives and true negatives are proportions of correct predictions of success or failure, a "hit rate", and false positives and false negatives are proportions of incorrect predictions, a "miss rate". We conducted analyses for all students combined, and for Black and White students separately (sample sizes were too small for analyses of other racial groups). Generally, the ACT Composite hit rates (students predicted to succeed who actually succeeded and students predicted to fail who actually failed) were equal to or slightly higher than the MAT hit rates at each institution, for all students and for Black and White students separately. At one of the three schools, the MAT hit rate to predict GPA was slightly higher than the ACT Composite hit rate for Blacks (.64 versus .60, Table 3).

We also computed "conditional" hit rates. In the present context, a conditional hit rate is the probability of success given an ACT Composite or MAT score above the cutoff. Conditional hit rates using the ACT Composite were again equal to or higher than those based on the MAT for both Black and White students in predicting retention and GPA, with one exception at the same school (Table 3).

A comparison of conditional hit rates between Black and White students indicates that prediction of GPA was better for White students than for Black students at all three schools using both the ACT Composite and the MAT (e.g., the conditional hit rates for the ACT Composite ranged from .74 to .77 for White students and .58 to .66 for Black students). Comparable analyses with retention as the outcome revealed no race differences.

Discussion

The MAT provides a standardized scale of academic talent independent of variables such as income, type of high school, or language spoken at home for various race by sex groups. In this study, however, the MAT did not add prediction accuracy over the ACT Composite (due to the high collinearity of the ACT Composite and the MAT) ro result in greater prediction accuracy than the ACT Composite, for the total group or for Black or White students. At one of three schools the MAT was associated with a small improvement of GPA prediction accuracy for Black students. Given large interinstitution variation in student body composition, and the institutional factors which influence student success, admissions officers at individual institutions may determine whether the MAT could be a useful predictor of college performance at their school. Admissions officers at institutions may also decide that a slight decrement in prediction accuracy is worth

the increase in minority admissions.

This work examined the ACT Composite and MAT as single predictors. Additional research on the MAT used in combination with other criteria may lead to greater prediction accuracy for some groups for the MAT relative to the ACT Composite. A longer follow-up period (e.g., graduation rates or sophomore GPA) may reveal benefits of the MAT, as may the examination of other cutoff rules and racial groups.

The conditional hit rates for both the ACT Composite and the MAT were lower for Blacks than for Whites in predicting GPA, and were similar for Blacks and Whites in predicting retention. As one primary purpose of standardized admissions tests is to predict college performance, one could argue that such tests disadvantage Blacks if Blacks are predicted to be less capable to perform college work than they actually are, relative to Whites. In fact, the conditional hit rates indicated that the prediction of college retention for capable Black students (i.e., those scoring above the cutoff) was equally as accurate as for Whites. Furthermore, the prediction of GPA for capable Black students showed that Blacks were predicted to do better than they actually did. That is, neither the ACT Composite nor the MAT disadvantage Blacks in the prediction of first year college GPA and retention. This finding is consistent with previous research using high school GPA (Lunneborg and Lunneborg, 1986) and standardized tests (Cleary, 1968; Cleary, Humphreys, Kendrick, and Wesman, 1975) to predict college performance, and suggests that Blacks may fail in college for reasons not directly related to their academic ability (Tracey and Sedlacek, 1987). The fact that Blacks receive lower grades than predicted, relative to Whites, may indicate that the educational environments of predominantly White

institutions are not conducive to promoting optimal performance of Black students.

The MAT is a measure of academic talent, yet when Blacks fail in college it is often for other reasons, such as lack of social and cultural support or poor study skills (Triesman, 1985). It may be that placing Black students into predominantly White college environments and expecting them to succeed at rates comparable to White students is unrealistic, especially if those students come from predominantly Black high schools or environments. These same students may succeed in college if provided with additional social/ cultural support or tutoring. The MAT may be explored as a means to identify these promising students with marginal ACT Composite scores who would benefit from additional support or tutoring in college. As suggested by Manning (1989), students who score well on the MAT have shown an ability to overcome disadvantageous conditions. Providing these students with extra support may enable them to "beat the odds" again in college. Informing high scoring students of their MAT score may in itself boost the academic self-esteem of minority students and contribute to their success.

A final potential use of the MAT would be to increase the cultural and racial diversity of a student body for its own sake, by identifying those students who may possess character traits such as persistence or ability to cope with adversity that would be valuable for all students to experience. Some colleges in their admissions decisions already consider in a qualitative sense the extent to which a student has overcome the educational consequences of poverty and discrimination; the MAT provides a way to quantify these considerations. Admissions officers may thus wish to explore the MAT as a means to meet their institution's objectives, be

they related to traditional academic performance or not.

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Table 1

Mean of ACT Composite Score and Background Characteristics, by Race/Ethnic Group and Sex

Race/ethnic and sex group	ACT Composite	Family income[1]	Number of sibs[2]	HS program[3]	ESL[4]	% Minority[5]
Black male	13.89	3.12	1.56	.58	.01	3.43
Black female	13.25	2.73	1.58	.57	.01	3.55
Nat-Am male	15.40	3.56	1.80	.47	.09	3.36
Nat-Am female	14.25	3.10	1.93	.45	.08	3.49
White male	20.37	5.21	1.39	.70	.01	2.03
White female	18.95	4.93	1.42	.68	.01	1.99
Mex-Am male	16.28	3.49	1.87	.59	.23	3.16
Mex-Am female	14.87	3.25	1.96	.54	.22	3.33
Asian male	20.59	4.59	1.70	.76	.35	1.56
Asian female	19.43	4.67	1.76	.75	.30	1.58
Puerto Rican male	17.93	4.02	1.63	.67	.43	2.55
Puerto Rican female	16.26	3.73	1.65	.61	.40	2.67

[1]Income is reported on a nine point scale (e.g., 2 = $12,000-$17,999; 3 = $18,000-$23,999; 4 = $24,000-$29,999; 5 = $30,000-$35,999; 6 = $36,000-$41,999 etc.)

[2]Number of siblings

[3]Type of high school program (1 = college prep, 0 = other)

[4]Primary language other than English spoken at home (0 = no, 1 = yes)

[5]% minority representation in high school, reported on a six point scale, higher value indicating greater minority representation

Table 2

Regression Statistics for Predicting ACT Composite

From Selected Background Characteristics, by Race/Ethnic and Sex Group

Race/ethnic and sex group	N	Regression coefficients						Multiple R	SEE
		Intercept	Income	Sibs	HS prog	Eng	% Min		
Black male	22,934	11.46	.42	- .09	3.45	- .54*	- .21	.41	4.78
Black female	33,252	11.20	.39	- .09	3.55	-1.13	- .25	.45	4.89
Nat-Am male	2,941	13.69	.39	- .18	4.12	-2.50	- .31	.50	8.26
Nat-Am female	3,627	12.51	.41	- .20	3.95	-2.25	- .20	.50	7.46
White male	26,067	16.99	.18	.17	4.51	-1.25	- .45	.42	5.28
White female	30,029	15.69	.23	.12	4.33	- .44*	- .49	.43	5.34
Mex-Am male	7,051	13.88	.32	- .10	4.30	-1.37	- .24	.45	6.99
Mex-Am female	8,563	12.75	.39	- .10	3.88	- .87	- .25	.48	6.34
Asian male	6,258	16.59	.70	- .41	4.36	-1.50	- .83	.56	13.11
Asian female	6,112	15.46	.60	- .33	4.58	-1.65	- .74	.56	12.14
Puerto Rican male	3,002	14.22	.52	- .15	4.09	- .89	- .21	.46	7.70
Puerto Rican female	3,626	13.27	.55	- .35	3.98	-1.03	- .20	.51	8.68

* $p > .05$

Table 3

Hit Rates for Predicting College GPA for Black & White Students

School A*

Blacks N=106

ACT Comp predicted success

		< 15	≥ 15
GPA	≥ 2.0	.05[a]	.49[b]
Actual			
Success	< 2.0	.11[c]	.35[d]

hit rate = .60

miss rate = .40

conditional hit rate = .58

MAT predicted success

		< 16	≥ 16
GPA	≥ 2.0	.06[a]	.53[b]
Actual			
Success	< 2.0	.11[c]	.30[d]

hit rate = .64

miss rate = .36

conditional hit rate = .64

Whites N=2451

ACT Comp predicted success

		< 15	≥ 15
GPA	≥ 2.0	.01[a]	.76[b]
Actual			
Success	< 2.0	.01[c]	.22[d]

MAT predicted success

		< 8	≥ 8
GPA	≥ 2.0	.01[a]	.76[b]
Actual			
Success	< 2.0	.01[c]	.22[d]

table continues

Table 3, cont.

hit rate = .77	hit rate = .77
miss rate = .23	miss rate = .23
conditional hit rate = .77	conditional hit rate = .77

[a] false negatives

[b] true positives

[c] true negatives

[d] false positives

hit rate = b + c

miss rate = a + d

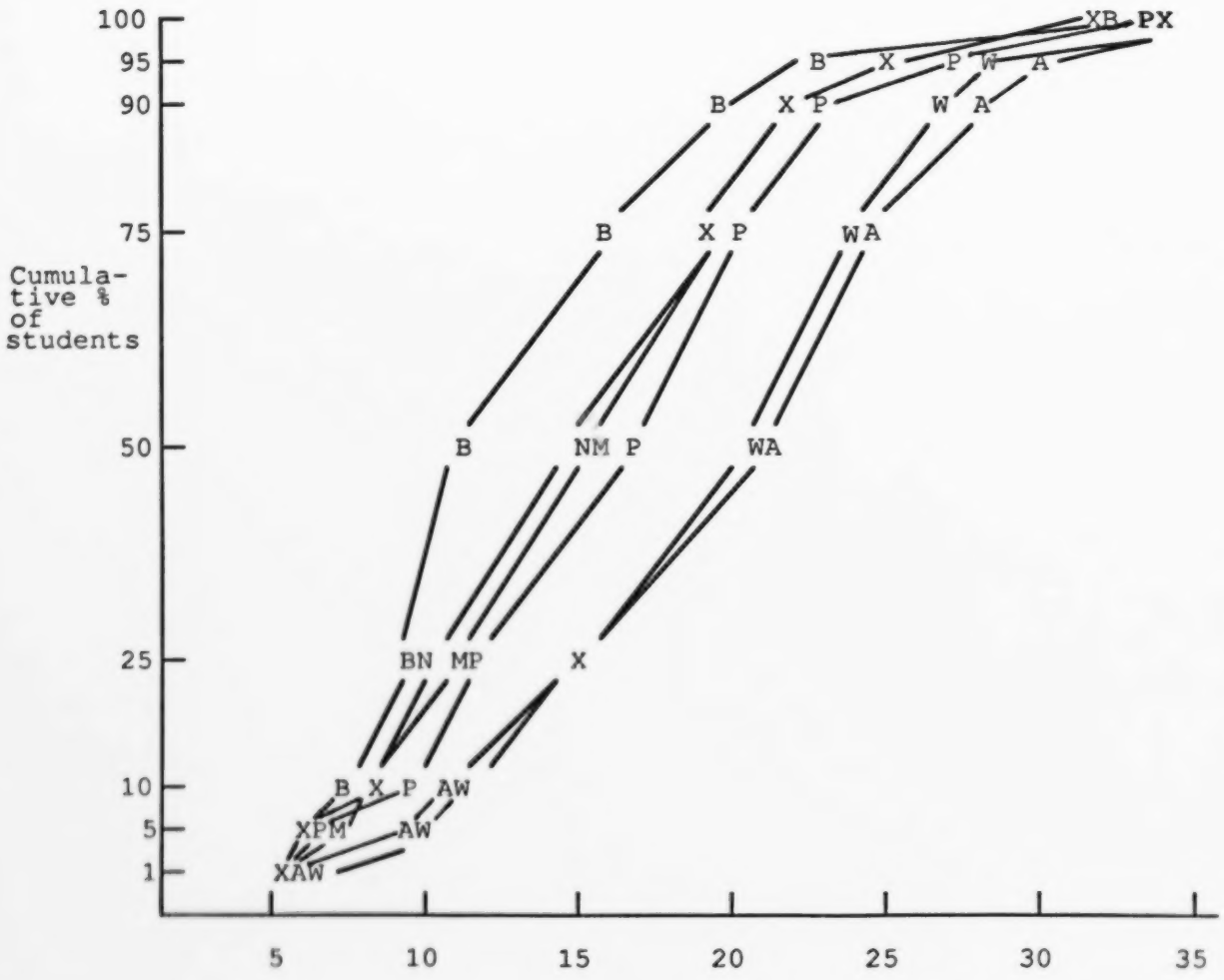
conditional hit rate = b/b+d

* Rates are for one of three schools. A copy of all hit rate tables is available upon request from the first author.

Figure Captions

Figure 1. ACT Composite distributions for Asian, Black, Mexican American, Native American, Puerto Rican, and White students.

Figure 2. MAT distributions for Asian, Black, Mexican American, Native American, Puerto Rican, and White students.



A=Asians (N=13,885)

B=Blacks (N=61,775)

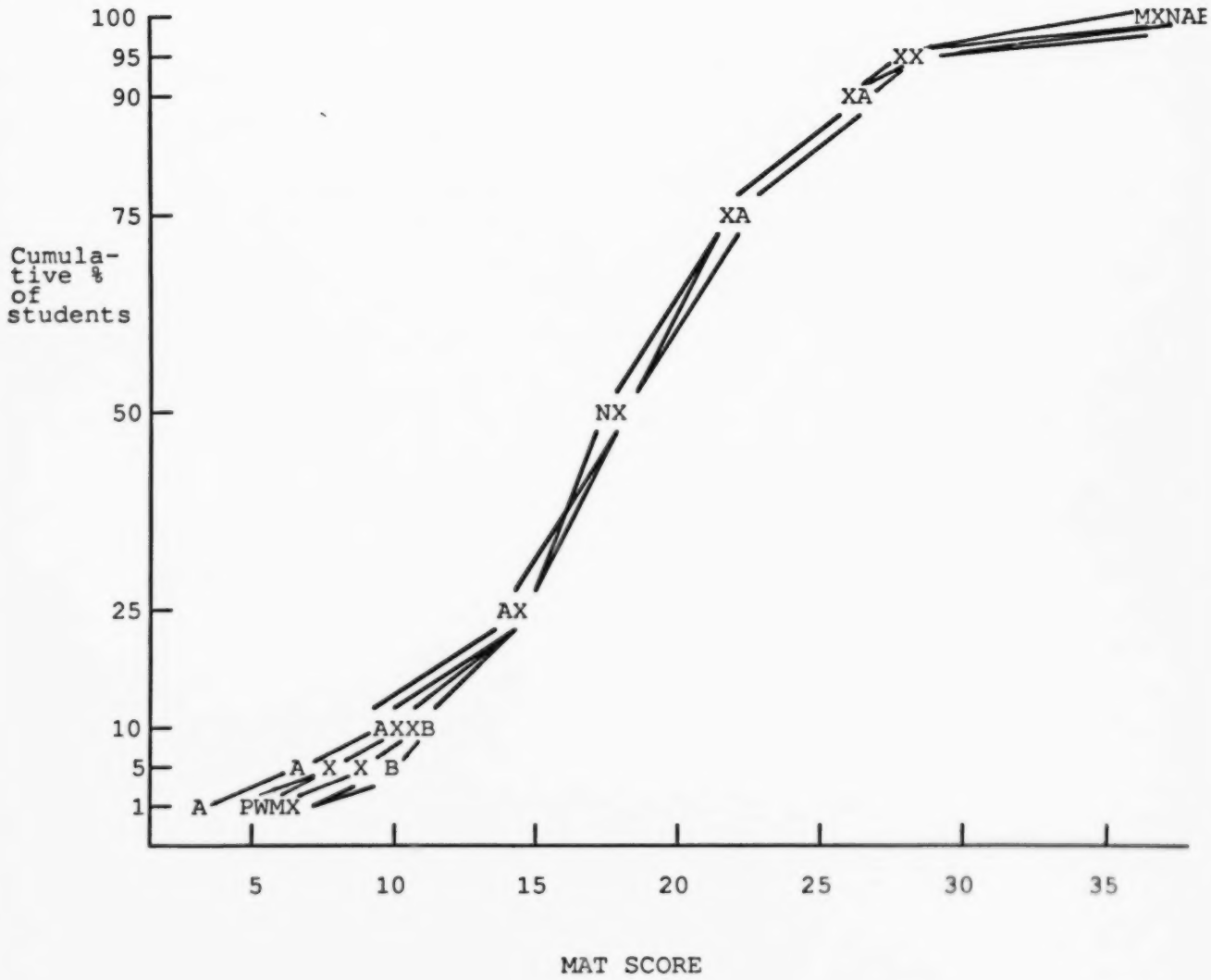
M=Mexican Americans (N=17,451)

N=Native Americans (N=7,359)

P=Puerto Ricans (N=7,566)

W=Whites (N=61,080)

X=more than one group at same score



A=Asians (N=12,370)

B=Blacks (N=56,186)

M=Mexican Americans (N=15,614)

N=Native Americans (N=6,568)

P=Puerto Ricans (N=6,628)

W=Whites (N=56,096)

X=more than one group at same score